

AMENDMENTS TO THE DRAWING

The attached sheet of drawings include changes to Fig. 3. This sheet, which includes Figs. 1-3, replaces original Fig. 3. In Fig. 3, features that were inadvertently and incorrectly incorporated into the formal drawings have been removed. The corrected Fig. 3 now corresponds to the figure originally submitted with the application.

Attachment: Replacement Sheet

Annotated Sheet Showing Changes

REMARKS

Claims 1-11, 14-15 and 17-90 are pending in the application. Claims 12, 13, and 16 were cancelled without prejudice. Claim 1 has been canceled herein without prejudice. Claims 91-93 are newly added. No new matter is added as support is found throughout the specification, for example in original claim 1, at paragraphs 0010-0012, 0019, 0021-0022, 0048-0052, 0059-0060, 0080-0106, and 0166, and in Figures 2, 3, 6A and 6B. Claims 2, 5, 6, and 10 have been amended to depend from newly added independent claim 91. Claims 2-11, 14-15, 17-21, and 91-93 are presented for examination; claims 22-90 have been withdrawn. The citations included throughout this amendment are to the paragraph numbers and page numbers of the published application (US 2005/0026037) unless otherwise specified.

Applicants note with thanks the indications in the Office Action of May 12, 2009 that claims 2-4 would be allowable if rewritten in independent form, and that claims 11, 14-15, and 17-21 are allowed.

The rejections in the Office Action of May 12, 2009 are addressed individually below.

Rejection under 35 U.S.C. §103

Claims 1, 5-6, and 10 were rejected under 35 U.S.C. §102(e) as being unpatentable over Chiang *et al.* (US Patent Application Publication No. 2003/0082446; “Chiang”). Applicants respectfully traverse this rejection.

The Office Action cites Figures 3A-3D and paragraph 0052 of Chiang and suggests that Chiang “discloses a bipolar device (10) having an arbitrary form factor” (Office Action of May 12, 2009, page 3). In addition, the Office Action cites paragraph 0053 of Chiang and suggests that Chiang “discloses the bipolar device having structures of reticulated interface can be tailored for the purposes of controlling and optimizing charge and discharge kinetics” (Office Action of May 12, 2009, page 3). Furthermore, the Office Action cites paragraph 0054 of Chiang and suggests that Chiang teaches that “the bipolar article has the possibility of an overall form that is not cylindrical or prismatic due to the aperiodic or random morphology”. Applicants respectfully disagree with these assertions because bipolar articles with structure features recited in independent claim 91 are not described or shown in Chiang.

Newly added independent claim 91 recites a bipolar article comprising a bipolar structure and a housing with an arbitrary form inside surface, wherein the bipolar structure as a whole has

an arbitrary form that is not cylindrical or prismatic; and at least one of the cathode and anode and its current collector is conformal to the inside surface of the housing. Exemplary bipolar articles as recited in claim 91 are described and shown in the specification, for example at Figures 3, 6A, and 6B.

In comparison, as shown in Figure 3A-3D in Chiang, the bipolar structures as a whole (including an anode, a cathode, an electrolyte, and cathode and anode current collectors) all have a square shape, i.e., not an arbitrary form as recited by claim 91. In addition, although as the Office Action suggests, Chiang teaches that “the bipolar device having structures of reticulated interface can be tailored for the purposes of controlling and optimizing charge and discharge kinetics” (paragraph 0053, Chiang), there is nothing in Chiang to teach or to suggest that the overall thickness or shape of the bipolar structure could be non-uniform or arbitrary as recited in claim 91. Furthermore, although Chiang teaches that reticulated features of the electrodes may be “aperiodic or random”, it also emphasizes that the “morphology of the structures exhibit shape complementarity towards one another such that where one electrode has a protrusion, the other tends to have a indentation of similar shape and dimension” (paragraph 0054, Chiang, emphasis added). Thus, due to such “‘mating’ interface” of the positive and negative electrodes (paragraph 0054, Chiang), the overall shape of the bipolar device in Chiang is not affected by the aperiodic or random morphology of the internal structural features of the anode and the cathode. Therefore, the bipolar articles taught by Chiang do not have arbitrary form factor as recited in instant claims.

The Office Action also suggests that Chiang teaches that the bipolar device in Figure 4 of Chiang has channels and perforations in electrodes which result in “non-cylindrical or non-prismatic” bipolar articles surfaces (Office Action of May 12, 2009, page 8). Applicants respectfully disagree with this assertion. As shown in Figure 4 of Chiang, the bipolar article as a whole, e.g., the positive electrode 406, negative electrode 408, and materials 1, 2, and 3 (400, 402, 404), form a bipolar device of uniform thickness and prismatic form. Thus, the current collectors as shown in Figure 4 do not contain any perforation and the outer surface of the bipolar structure, i.e., the surface of the current collector 30 as shown in Figure 4 of Chiang, remains planar, i.e., not an arbitrary form as recited by claim 91.

Furthermore, Chiang does not teach or suggest that at least one of the cathode, the anode, and their respective current collectors is conformal to a housing’s inside surface with arbitrary form factors as recited in claim 91. As illustrated in Figure 3A-3D of Chiang, all of Chiang’s

bipolar structures have an overall planar surface, thus are not able to be conformal to any housing's inside surface which has an arbitrary form.

Applicants have surprisingly found that arbitrary form factors of the bipolar structures result in "efficient use of space" and "provide for greater practical energy densities" (paragraph 0049, instant specification), thus providing surprising and unexpected improvements in cell performance. Furthermore, bipolar articles having arbitrary form factors "advantageously allow for a reduced number of parts in devices in which they are used, thereby simplifying the design and reducing the cost of the devices" (paragraph 0049, instant specification).

Accordingly, currently amended claim 91 is novel and non-obvious in view of Chiang. Dependent claims 5-6 and 10 also are not anticipated by and non-obvious over Chiang.

Claims 7-9 were rejected under 35 U.S.C. §103(a) as being obvious over Chiang in view of Lanni et al (US Patent No. 5,949,213, "Lanni"). Applicants respectfully traverse this rejection.

Claims 7-9 depend from claim 91 and recite that the bipolar article is conformal with a surface or space-filling within a cavity of a device, or identify specific types of devices.

As discussed above, claim 91 is non-obvious over Chiang. Lanni does not remedy Chiang's deficiencies. Lanni teaches an improved system and method for charging rechargeable batteries (column 3, line 52-55, Lanni). Lanni does not disclose a bipolar structure with an arbitrary form factor, nor does it teach that at least one of the cathode, the anode, and their respective current collectors is conformal to a housing's inside surface with an arbitrary form factor as recited in instant claim 91. Lanni does not recognize the significance of such arbitrary-shape features of the bipolar structures in improving efficiencies and energy densities and provides no teachings that such features could be introduced to a bipolar device to result in greater energy densities, simplified designs, reduced cost, and efficient use of space, as taught by the instant specification (paragraph 0049, instant specification). Therefore, independent claim 91 is non-obvious over Chiang in view of Lanni. Dependent claims 7-9 depend from claim 91 are likewise non-obvious over Chiang in view of Lanni.

Conclusion

In view of the above amendments and remarks, it is respectfully believed that the rejections in the Final Office Action of May 12, 2009 have been overcome and that all of the pending claims are in condition for allowance.

If the Examiner believes that a telephone interview would help expedite the successful prosecution of the claims, the Examiner is encouraged to telephone the undersigned at the number listed below.

No fee is believed to be due in connection with this response; however, should a fee be required, please charge to Deposit Account No. 08-0219, under our order number 0112903.00128US2.

Respectfully submitted,
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Date: August 12, 2009

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